AN ASSESSMENT OF THE COSTS AND BENEFITS OF AN ETHANOL INDUSTRY IN ALBERTA

ALBERTA GRAIN COMMISSION

FINAL REPORT (AMENDED)

MAY 11, 1988

AN ASSESSMENT OF THE COSTS AND BENEFITS OF AN ETHANOL INDUSTRY IN ALBERTA

EXECUTIVE SUMMARY

BACKGROUND TO THE STUDY

- The Project Terms of Reference called for a review of the analysis undertaken by the Government of Alberta and the refinement of this analysis based on additional information which may be identified.
- In the short time frame available for the study (3 weeks) several issues requiring refinement were identified.
- The contents of this presentation represent the "first cut" of the analysis of additional information, and should not be construed as a definitive answer to the assessment of the costs, benefits and economic impact of a fuel ethanol industry in Alberta.
- Further analysis is required to comprehensively address the costs, benefits and economic impact of a fuel ethanol industry in Alberta.
- Issues requiring additional study have been identified at the end of this document.

FINDINGS

- The analysis undertaken by the Alberta Government Ethanol Fuels Committee is fundamentally sound and has been modified in selected areas.
- The fuel ethanol industry would require a subsidy level of 29 cents/litre of ethanol to be of interest to the gasoline refining industry under current conditions.
- The maximum projected market penetration of fuel ethanol is 30% of the gasoline sold in Alberta. This represents a volume of 1.3 billion litres of gasohol or 130 million litres of ethanol.

- The direct impact for each year on the key parties involved at this maximum expected level is estimated as follows:

	Benefit or (Cost) ($ Millions)
Agriculture Industry	$ 2.4
Ethanol Industry	23.8
Government of Alberta	(38.4)
TOTAL	$(12.2)

- After estimating spin-off effects the total maximum impact on the Alberta economy is as follows:

Annual economic output generated	$107.9
Annual reduction in consumption	(88.3)
Net economic impact on the provincial economy	$ 19.6

CONCLUSIONS

These conclusions were formulated in reference to the basic criteria established by the Ethanol Fuels Committee and based on the assumptions that underlie this analysis.

1. **"Must maintain or increase the markets for agricultural products".**

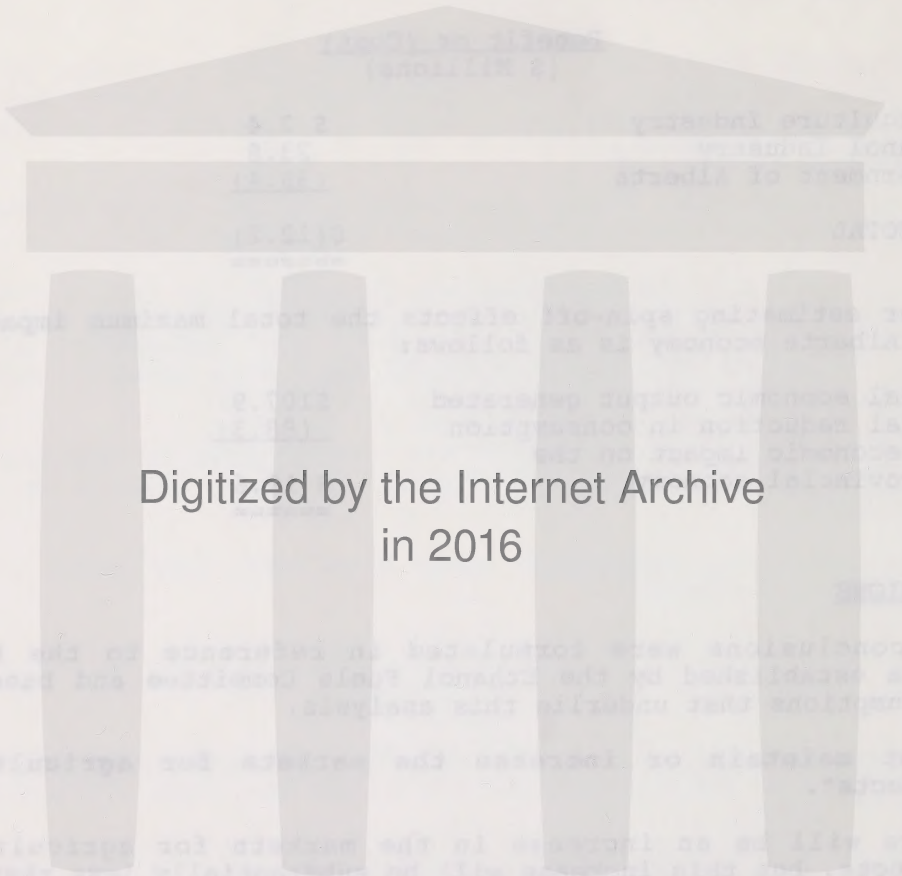
   There will be an increase in the markets for agricultural products, but this increase will be substantially less than the total ethanol industry feedstock requirements.

2. **"Must equal or improve the level of environmental protection".**

   The evidence suggests that both beneficial and detrimental effects may occur. No strong evidence exists to demonstrate that the level of environmental protection would on balance decrease.

3. **"Must retain or improve the safety associated with the handling of fuels".**

   When ethanol fuels are properly blended the safety level associated with fuel handling is maintained.



4. **"Must comply with current government regulations and legislation".**

   The analysis does not assume the by-passing of current regulations and legislation.

5. **"Must achieve a net positive economic benefit for Alberta".**

   According to the analysis which follows, the maximum positive benefit to the province would be $19.6 million. However, this number has been arrived at using multipliers that are not specific to the ethanol industry as such multipliers were unavailable. Accordingly, and within the context of overall cost and benefit flows, approximately $200 million (including spin-off effects), the province cannot be assured of a net positive or negative economic benefit.

6. **"Must not require long-term net public financial support".**

   No evidence exists from this analysis that suggests that public support could be eventually removed and that the industry could be self-sustaining.

Touche Ross

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Prepared by:

TOUCHE ROSS MANAGEMENT CONSULTANTS

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TABLE OF CONTENTS

I. GOVERNMENT ANALYSIS OF COSTS AND BENEFITS

I. GOVERNMENT ANALYSIS OF COSTS AND BENEFITS

AGRICULTURAL IMPACTS:

$34.6 Million	Gross Revenue Increase
$6.1 Million	Potential Benefit from Distiller's Grains
($1.2 Million)	Cost to Domestic Livestock Industry Due to Price Increase
$39.5 Million	Potential Agriculture-related

COSTS TO GOVERNMENT:

($33.1 Million)	Ethanol Subsidy Cost
$6.4 Million	NET BENEFIT

II. KEY ISSUES

II. KEY ISSUES

1. IMPACT OF INCREMENTAL MARKETS FOR BARLEY ON BARLEY PRICES.
2. INCREMENTAL GRAIN PRODUCTION REQUIRED TO MEET FEEDLOT REQUIREMENTS.
3. REVENUE GAINS TO THE AGRICULTURAL SECTOR.
4. USE OF DISTILLERS GRAINS AS A PROTEIN SUPPLEMENT FOR CANOLA MEAL OR SOYBEAN MEAL.
5. DISPLACEMENT OF CRUDE.
6. INDIRECT COSTS AND BENEFITS.
7. INCREMENTAL COSTS TO REFINERIES OF INCORPORATING ALCOHOL BLENDS IN PRODUCT MIX.
8. PERCEIVED VALUE OF ETHANOL TO REFINERS OR BLENDERS.
9. "DRIVERS" OF THE ETHANOL INDUSTRY.
10. ETHANOL AS A REPLACEMENT FUEL FOR DIESEL.
11. FREE TRADE IMPLICATIONS:
    - (A) Grain Prices
    - (B) Ethanol Markets
12. MEGA-PROJECTS VS. MULTI-INTEGRATED FEEDLOT APPROACH.

III. ANALYSIS OF KEY ISSUES

III. ANALYSIS OF KEY ISSUES

1. *IMPACT OF INCREMENTAL MARKETS FOR BARLEY ON BARLEY PRICES:*
    - price response overstated;
    - long and gradual market adjustment will moderate price response.

2. *INCREMENTAL GRAIN PRODUCTION REQUIRED TO MEET FEEDLOT REQUIREMENTS:*
    - gross revenue increase to agriculture sector overstated;
    - only a portion 50% of incremental grain requirements assumed to be met through incremental production, remainder to be supplied through a reallocation of grain to export markets.

3. *REVENUE GAINS TO AGRICULTURAL SECTOR:*
    - discussion paper assumed gross revenues;
    - variable costs of production ($60.59/tonne) incurred;
    - revenue gain to agriculture sector = selling price less variable costs of production.

III. ANALYSIS OF KEY ISSUES (Continued)

4. USE OF DISTILLERS GRAINS AS A PROTEIN SUBSTITUTE FOR CANOLA MEAL OR SOYBEAN MEAL:

- Value of distillers grains derived on the basis of a combined use as a feed replacement and protein supplement.
- Current practice supports the use of distillers grains as an energy source (feed replacement) rather than a protein supplement.
- As an energy source, a 1:1 replacement for barley as a livestock feed by WDG is assumed.
- WDG reduces magnitude of incremental markets for barley created as a result of the ethanol industry.
- Alberta cattle industry does not use soybean meal as a protein supplement.
- Domestically produced canola meal is used as a protein supplement.
- Benefits to livestock industry associated with replacement of canola meal with WDG as a protein supplement are assumed to "wash" with the negative impact to the provincial canola industry.

III. ANALYSIS OF KEY ISSUES (Continued)

5. DISPLACEMENT OF CRUDE:

- Probably not an issue.
- At 100% market penetration, crude displaced represents 1% of total Alberta exports.
- High likelihood of absorption by current export market.

6. INDIRECT COSTS AND BENEFITS:

- Measurement of "spin-off" costs/benefits and job creation resulting from the establishment of an ethanol industry.
- Calculated using multipliers developed on basis of inputs/outputs.
- Two spin-off effects:
  - economic injection of funds, and
  - job creation.

III. ANALYSIS OF KEY ISSUES (Continued)

7. INCREMENTAL COSTS TO REFINERIES OF INCORPORATING ALCOHOL BLENDS IN PRODUCT MIX:

- Incremental costs from the refiners' perspective include;
  - capital required for additional tank and blending facilities at the refinery and additional infrastructure at retail point of sale,
  - costs associated with displacement of crude (this may not be critical as refinery capacity will shift towards other processing requirements, e.g., heavy crude),
  - incentive to cover potential risk of customer rejection of alcohol gasolines.
- Incremental cost to refinery of 1.5 cents/litre above breakeven value of ethanol as an octane enhancer has been incorporated into the analysis.

8. PERCEIVED VALUE OF ETHANOL TO REFINER OR BLENDER:

- Value of ethanol is a function of its use.
- Three potential uses of ethanol:
  - gasoline extender,
  - octane enhancer,
  - co-solvent for methanol.
- Use of ethanol by refiner/blender has implications re: level of government subsidy required and market penetration.

III. ANALYSIS OF KEY ISSUES (Continued)

9. "DRIVERS" OF THE ETHANOL INDUSTRY:

- Gasoline alcohol blends in selected U.S. states have achieved a market penetration of up to 35-40% with subsidy levels of 30-40 cents Canadian/ litre.
- Acceptance of ethanol in these states can be attributed to several factors;
  - a strong agricultural lobby mounted by corn growers in states such as Iowa and Nebraska,
  - a commitment towards achieving energy self-sufficiency through the use of ethanol as a gasoline extender,
  - distribution infrastructure of U.S. oil industry better developed to meet distribution requirements of alcohol gasolines,
  - strong environmental lobby in selected states with chronic air pollution problems, e.g. Colorado, California.
- Market penetration in Canada (and Alberta) is likely to be more conservative and will occur over a period of time.

III. ANALYSIS OF KEY ISSUES (Continued)

10. ETHANOL AS A REPLACEMENT FUEL FOR DIESEL:

- Several studies have been undertaken in this area.
- Technology does not exist in Canada.
- Substitution of ethanol for diesel fuel may be accomplished through four mechanisms;
  - retrofitting of diesel powered farm equipment with a diesel fumigation kit (30-40% substitution of ethanol for diesel) but "kit" not yet commercially available,
  - mixing of ethanol, diesel and a proprietary additive to keep the blend stable (5-10% ethanol substitution not economically viable),
  - addition of an octane improver to ethanol to improve burning characteristics of the fuel (100% substitution but results in problems of a technical nature),
  - conversion of diesel engine to spark system but would incur substantial cost.

III. ANALYSIS OF KEY ISSUES (Continued)

11. FREE TRADE IMPLICATIONS:

(a) Grain Prices

- FTA provisions for barley;
  - removal of import quotas,
  - elimination of 5% tariff over a ten-year period on both sides of the border.
- No significant change in either imports/exports or grain prices is expected.
- Removal of corn countervail under separate action may impact barley markets and prices in Eastern Canada;
  - depress domestic corn prices,
  - substitution of corn for barley.

III. ANALYSIS OF KEY ISSUES (Continued)

11. FREE TRADE IMPLICATIONS (continued):

(b) Ethanol Markets

- FTA provisions for oxygenates:
  - five year phase-out of import tariffs for MTBE,
  - ten year phase-out of import tariffs for ethanol.
- U.S. imports of ethanol represent a threat to a Canadian ethanol industry:
  - U.S. industry highly subsidized,
  - production costs generally lower due to cheaper feedstocks and larger economies of scale.

... BUT ...

as a barley product, ethanol is subject to the stipulation that subsidy levels for barley production must be equivalent before duty free access is provided.

III. ANALYSIS OF KEY ISSUES (Continued)

11. FREE TRADE IMPLICATIONS (continued):

(b) Ethanol Markets (continued)

- Subsidies for U.S. barley industry are significantly greater than those to the Canadian industry ($1.05 Canadian/bushel in U.S. versus $0.33 Canadian/bushel in Canada).
- As an agricultural product, Canada can restrict imports of U.S. ethanol until subsidies are equivalent.
- Unlikely that U.S. will reduce subsidies strictly for the purpose of gaining access to Canadian ethanol markets. U.S. imports of ethanol not likely to threaten a Canadian ethanol industry.
- An Alberta subsidy program to the ethanol industry may be threatened under free trade, i.e., an unfair trade practice.

III. ANALYSIS OF KEY ISSUES (Continued)

12. MEGA-PROJECT vs. MULTI-INTEGRATED FEEDLOT APPROACH:

- Structure of industry has implications with respect to:
  - production costs of ethanol (increased energy costs to dry by-product),
  - economies of scale in labor,
  - markets for distillers grains,
  - dispersion of economic benefits (sourcing of feedstock),
  - market acceptance as as result of improved access to terminal facilities and distribution to local markets.

IV. REFINED ANALYSIS OF COSTS AND BENEFITS

THIS SECTION OF THE REPORT EXAMINES THE COSTS AND BENEFITS TO ALBERTA IN A QUANTITATIVE MANNER. THE ANALYSIS USES THE FOLLOWING METHODOLOGY FOR EACH OF SEVERAL SCENARIOS.

1. Direct costs and benefits were estimated to each of the three key parties involved; the agriculture industry, the ethanol industry and the Government of Alberta.

2. Total Economic Activity was examined through the application of economic multipliers on the raw data to derive an indication of the positive and negative spin-off effects and the net economic benefit to the province. These economic multipliers were extracted from Alberta Treasury Department guides. A key assumption in this analysis is that the government will maintain a balanced budget and will fund the subsidy through an increase in taxes.

3. All numbers are expressed in constant Canadian dollars unless otherwise indicated.

COSTS/BENEFITS OF ETHANOL INDUSTRY TO ALBERTA

	GOV'T DISCUSSION PAPER	AS REFINED
ASSUMPTIONS:		
	• 30% Market Penetration • 25 cent/litre ethanol subsidy	• 30% maximum market penetration • 13 plants with capacity 10 mm litres/plant • 29 cent/litre ethanol subsidy

ASSUMPTIONS - AGRICULTURAL IMPACT

[1] WDG displaces feed grain on a one-to-one dry matter basis.
50% of net feedstock requirement from incremental production.
50% of net feedstock requirement from reallocation of exports.

[2] No Soybean Meal Import Displacement - Soybean meal not used as a protein supplement for beef cattle in Alberta.

Sources: Arnold Pierce
Nutritionist
United Feeders

John Alker
Nutritionist
Sure-gain

Ron Weisenberger
Alberta Agriculture
Beef Cattle and Sheep Branch

[3] Assumes no price response due to incremental markets.

[5] Incremental production x $60.59. Source: Agriculture Alberta Statistical Handbook.

DIRECT COSTS/BENEFITS (cont'd)

	GOV'T DISCUSSION PAPER	AS REFINED
	($ millions)	
AGRICULTURAL IMPACTS:		
• Gross Revenue Increase	$34.6	$10.0 [1]
• Potential Benefit from Distillers Grains	6.1	0 [2]
• Cost to Domestic Livestock Industry	(1.2)	0 [3]
• Incremental Variable Costs of Production	[5]	(7.6) [5]
AGRICULTURE	*$39.5*	*$2.4*

This table compares the original Government of Alberta report with the revised analysis.

ASSUMPTIONS - ETHANOL INDUSTRY

7 Not Addressed.

8 Volume x $0.51/l.

9 Volume x $0.33/l.

10 $0.25/litre subsidy x 132 million litres.

11 $0.29/litre subsidy x 132 million litres.

DIRECT COSTS/BENEFITS (cont'd)

	GOV'T DISCUSSION PAPER	AS REFINED
	($ millions)	
ETHANOL IMPACTS:		
• Gross Revenue Increase	[7]	$67.1 [8]
• Variable Operating Costs	[7]	(43.3) [9]
ETHANOL		23.8
GOVERNMENT IMPACT:		
• Ethanol Subsidy Cost	($33.1) [10]	($38.4) [11]
TOTAL DIRECT COSTS/ BENEFITS	$6.4	($12.2)

This table presents the comparison of the two studies on the ethanol industry, the Government of Alberta and the sum of the directly affected parties.

[15] 13 people/plant/year.

[16] (4% x Incremental Variable Costs of Production)/$35,000/job.

DIRECT COSTS/BENEFITS (cont'd)

	GOV'T DISCUSSION PAPER	AS REFINED
SUSTAINED JOB CREATION:		
• Ongoing		
- Ethanol Plants		172[15]
- Agriculture		9[16]
		181

[17] Capital cost of 13.2 plants x 9 million $/plant.

[18] Alberta Treasury Department, Bureau of Statistics (Construction multiplier).

[19] Actual Ethanol Revenue = 67.1 million; feedstock input value was subtracted to prevent double counting multiplier impact already considered from the agriculture industry.

[20] Alberta Treasury Department, Bureau of Statistics (Chemical Industry multiplier used as a proxy).

[21] Alberta Treasury Department, Bureau of Statistics.

[22] Alberta Treasury Department, Bureau of Statistics (Gross Output multiplier for households). This figure represents the decrease in economic activity due to reduced consumption as a result of tax increases.

TOTAL ECONOMIC ACTIVITY
(Direct, Indirect and Induced Income)

ECONOMIC IMPACTS: *($ Millions)*

	Capital Cost	*Multiplier*		
• ONE-TIME				
- Plant Construction	118.8[17]	x 2.7[18]	=	$318.0

	Incremental Revenue	*Multiplier*		
• ONGOING				
- Ethanol Operation	39.6[19]	x 2.2[20]	=	87.1
- Grain Production	10.0	x 2.1[21]	=	20.8
				$107.9
- Government	(38.4)	x 2.3[22]	=	(88.3)

NET ONGOING ECONOMIC BENEFIT TO ALBERTA	$19.6

[23] Alberta Treasury Department, Bureau of Statistics (number of jobs $1,000,000 of Expenditure - Construction).

[24] Deflator to convert current dollars to 1979 dollars. 1979 Input/Output tables derived by the Alberta Treasury Board.

[25] Alberta Treasury Department, Bureau of Statistics (number of jobs created/$1,000,000 of revenue - Chemical Industry).

[26] Alberta Treasury Department, Bureau of Statistics (number of jobs created/$1,000,000 of revenue - Chemical Industry).

[27] Alberta Treasury Department, Bureau of Statistics (number of jobs created/$1,000,000 of revenue - households).

TOTAL ECONOMIC ACTIVITY (Continued)
Direct, Indirect and Induced Income

JOB CREATION:	Expenditure ($ Millions)		Multiplier		Deflator		
• ONE TIME CONSTRUCTION	$118.8	x	32.5 [23]	/	1.64 [24]	=	2,354
	Revenue						
• ONGOING	($ Millions)		Multiplier		Deflator		
- Ethanol	39.6	x	16.6 [25]	/	1.64	=	400
- Agriculture	10.0	x	37.2 [26]	/	1.64	=	228
Total Ongoing							628
• GOVERNMENT (Decrease in Direct consumption through increased taxes)	(38.4)	x	21.5 [27]	/	1.64	=	(503)
NET TOTAL ONGOING JOB CREATION							125

SUMMARY OF ONGOING COST/BENEFIT ANALYSIS UNDER THIS MAXIMUM IMPACT SCENARIO

	GOV'T DISCUSSION PAPER	AS REFINED
A. DIRECT COSTS AND BENEFITS	($ Millions)	
• Agriculture	39.5	2.4
• Ethanol	---	23.8
• Government	(33.1)	(38.4)
TOTAL	6.4	(12.2)

B. TOTAL ONGOING ECONOMIC ACTIVITY (Including Spin-off Effects)	($ Millions)	
• Agriculture		$20.8
• Ethanol		87.1
• Government		(88.3)
NET ECONOMIC BENEFIT TO ALBERTA		$19.6

** PLEASE NOTE THESE TWO ANALYSES SHOULD NOT BE CONSTRUED AS ADDITIVE*

V. ADDITIONAL SCENARIOS

SCENARIO I - FIVE YEAR BASE CASE

- This first scenario uses the same methodology as was seen in Section IV of the report and demonstrates how the ethanol industry might develop over time.

- The key conclusion from this analysis is that the ethanol industry will take several years to develop if it were to develop at all.

- Please note that economic spin-off effects can take more than one year to diffuse through the economy; therefore, the tables should be construed as indicating when the benefit or disbenefit begins and does not imply the entire effect is expressed in that year.

[28] Alberta Government Oil Price Scenario 1 - Alberta Grain Commission.

[29] Agriculture Canada - Midterm Outlook.

[30] Energy in Canada 1987 / Hycarb Engineering.

[31] Based on potential growth per selected U.S. states.

SCENARIO I - FIVE YEAR BASE CASE
Ethanol as an Octane Enhancer

ASSUMPTIONS:	*1989*	*1990*	*1991*	*1992*	*1993*
Crude Oil Price ($US/bbl)[28]	18	18	18	18	18
Barley Price ($/tonne)[29]	80	86	81	93	98
Alberta Gasoline Sales (billions of litres)[30]	4.4	4.4	4.4	4.4	4.4
Market Penetration[31]	5%	10%	15%	20%	25%
Number of Plants	2	4	7	9	11
Subsidy Level (Cents/Litre)	.32	.32	.32	.32	.32

SCENARIO I - FIVE YEAR BASE CASE
Ethanol as an Octane Enhancer

DIRECT COSTS AND BENEFITS ($ Millions)	*1989*	*1990*	*1991*	*1992*	*1993*
AGRICULTURE:	0.4	1.1	1.3	2.7	3.9
ETHANOL INDUSTRY	4.0	7.9	11.9	15.8	19.8
GOVERNMENT COSTS:					
• Ethanol Subsidies	(7.0)	(14.1)	(21.1)	(28.2)	(35.2)
NET DIRECT IMPACT ON ALTA	(2.6)	(5.1)	(7.9)	(9.7)	(11.5)

SCENARIO I - FIVE YEAR BASE CASE
Ethanol as an Octane Enhancer

JOB CREATION - DIRECT:	*1989*	*1990*	*1991*	*1992*	*1993*
SUSTAINED:					
• Agriculture	1	3	4	6	7
• Ethanol	29	57	86	114	143
TOTAL	30	60	90	120	150

SCENARIO I - FIVE YEAR BASE CASE
Ethanol as an Octane Enhancer

TOTAL ECONOMIC ACTIVITY:	*1989*	*1990*	*1991*	*1992*	*1993*
ONE-TIME:					
Plant Construction Output ($x10 ^{6})	53.1	106.1	159.2	212.3	265.3
SUSTAINED:					
• Agriculture	3.5	7.4	10.5	16.1	21.2
• Ethanol	14.5	29.0	43.6	58.1	72.6
• Government (Household Impact)	(16.2)	(32.3)	(48.6)	(64.8)	(80.9)
NET ECONOMIC BENEFIT TO ALBERTA	1.8	4.1	5.5	9.4	12.9

SCENARIO 1 - FIVE YEAR BASE CASE
Ethanol as an Octane Enhancer

TOTAL JOB CREATION INCLUDING SPIN-OFF EFFECTS:	*1989*	*1990*	*1991*	*1992*	*1993*
ONE-TIME PLANT CONSTRUCTION	392	785	1,177	1,570	1,962
SUSTAINED					
• Agriculture	38	82	115	176	232
• Ethanol	67	134	200	267	334
• Government (Household Consumption effect)	(92)	(185)	(277)	(369)	(461)
TOTAL SUSTAINED	13	31	38	74	105

SCENARIO II - ETHANOL AS A COSOLVENT

This scenario examines the use of ethanol as a cosolvent in gasoline as opposed to an octane enhancer. As a cosolvent, ethanol would be mixed with methanol and gasoline to produce a 3% ethanol, 5% methanol, 92% gasoline blend. These blends have been the predominant use of ethanol in Canada to date, and have been used almost exclusively by small independent marketers. The relatively low cost of methanol makes this option attractive to independent blenders.

In the United States, methanol cosolvents have primarily been other industrial alcohols such as tertiary butyl alcohol (e.g. Arco's Oxinol), source: Federal Goverment Department of Energy, Mines & Resources.

32 Pre-feasibility study for the Alberta government by St. Lawrence Starch

Hycarb Engineering.

SCENARIO II - ETHANOL AS A COSOLVENT
Cost/Benefit Summary

($ millions)

A. DIRECT ON-GOING COSTS AND BENEFITS:

• Agriculture	$ .2
• Ethanol	1.7
• Government	(2.3)
TOTAL	($ .4)

B. TOTAL ONGOING ECONOMIC IMPACT INCLUDING SPIN-OFF EFFECTS:

• Agriculture	$1.5
• Ethanol	6.1
• Government (Household Impact)	(5.3)
NET ECONOMIC BENEFIT	$2.3

ASSUMPTIONS:

• Market Penetration	7%[32]
• Subsidy Level	$0.25/l
• Methanol Price	$0.16/l

* *PLEASE NOTE THAT THESE TWO ANALYSES SHOULD NOT BE CONSTRUED AS ADDITIVE*

SCENARIO III - ETHANOL AS A FUEL EXTENDER

This scenario examines the use of ethanol as a fuel extender, i.e. ethanol is added to gasoline containing standard octane levels at a 10% proportion of the total blend. This practice is currently undertaken in Manitoba and is attractive primarily to the independent blender when the net cost of ethanol is less than the net cost of gasoline. Blends of this type technically exceed vapor pressure regulations, but have not proved to have shown any significant problems in Manitoba.

This method of blending fuels raises the direct subsidy required to make the product attractive.

SCENARIO III - ETHANOL AS A FUEL EXTENDER
Economic Activity Summary

($ millions)

A. DIRECT ON-GOING COSTS AND BENEFITS:

• Agriculture	$ .6
• Ethanol	5.5
• Government	(9.8)
TOTAL	($3.7)

B. TOTAL ONGOING ECONOMIC IMPACT INCLUDING SPIN-OFF EFFECTS:

• Agriculture	$ 4.8
• Ethanol	20.3
• Government (Household Impact)	(22.5)
NET ECONOMIC BENEFIT	2.6

ASSUMPTIONS:

• Market Penetration	7%
• Subsidy Level	$0.32/l

* *PLEASE NOTE THAT THESE TWO ANALYSES SHOULD NOT BE CONSTRUED AS ADDITIVE*

SCENARIO IV - ETHANOL AS AN OCTANE ENHANCER WITH A MEGA ETHANOL PLANT

This scenario examines the impact of a single large (130 million litre/year) ethanol facility with significant economies of scale. This approach is to examine whether or not the industry once developed can become efficient enough to be self-sustaining.

The purpose of this analysis is to assess the costs and benefits of a single mega - project in relation to a number of small integrated plants.

It is important to note that a large plant is not feasible under the assumption that the industry would develop gradually.

The conclusion that can be drawn from this analysis is that even a mega-plant with current technology cannot be self-sustaining without continued government subsidies for the industry.

SCENARIO IV - ETHANOL AS A OCTANE ENHANCER MEGA PLANT

Economic Activity Summary

($ millions)

A. DIRECT ON-GOING COSTS AND BENEFITS:	
• Agriculture	$2.4
• Ethanol	16.4
• Government	(25.3)
TOTAL	($6.5)
B. TOTAL ONGOING ECONOMIC IMPACT INCLUDING SPIN-OFF EFFECTS:	
• Agriculture	$20.8
• Ethanol	58.3
• Government (Household Impact)	(58.2)
NET ECONOMIC BENEFIT	20.9

ASSUMPTIONS:

• Market Penetration	30%
• Subsidy Level	$0.19/l

* *PLEASE NOTE THAT THESE TWO ANALYSES SHOULD NOT BE CONSTRUED AS ADDITIVE*

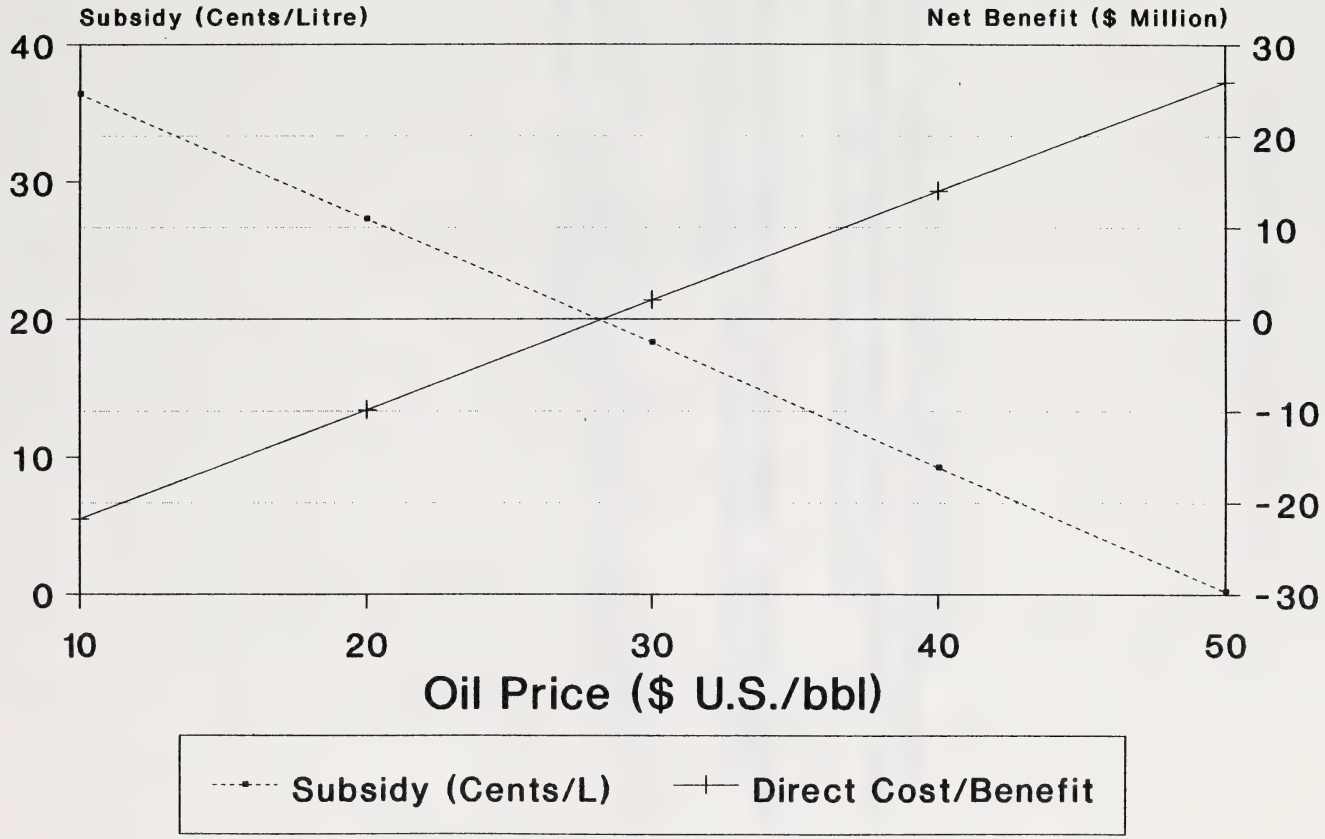
OIL PRICE IMPACTS

The graph on the following page demonstrates the impact of various levels of oil prices on the level of subsidy and net direct impact on the three key parties of agriculture, ethanol and government. No adjustment has been made for the increased energy input costs required to produce the feedstock for the ethanol plant.

The two key points on this slide indicate that the required subsidy level drops to zero at an oil price of $50 U.S./bbl and the sum of the direct impacts on the three key parties is zero at an oil price of approximately $28 U.S./bbl, and a subsidy level of 20 cents/litre of ethanol.

Alberta Grain Commission

Oil Price Scenarios



GRAIN PRICE IMPACTS

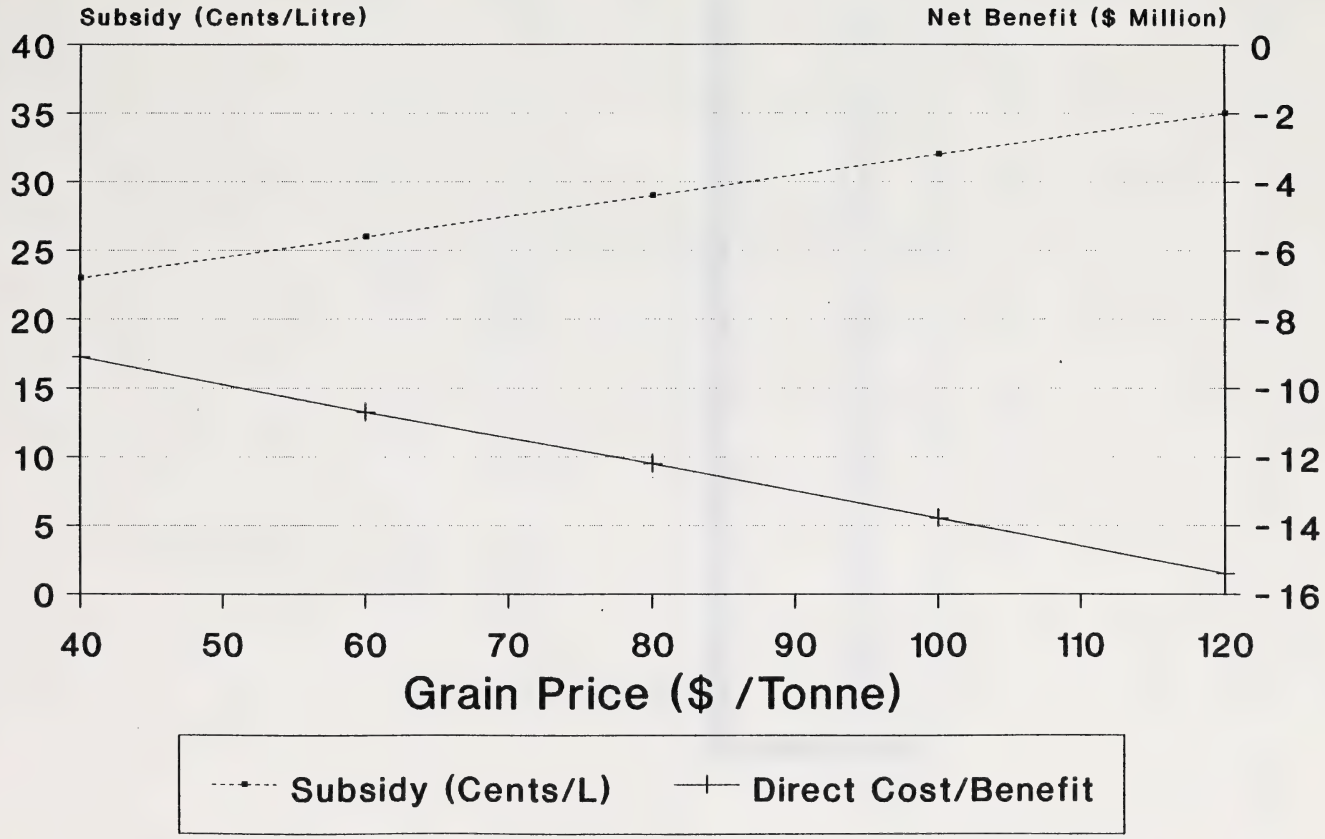
The graph on the following page demonstrates the relationship between a relevant range of grain prices and its corresponding impact on subsidy levels, and direct costs and benefits to the three key parties affected.

No assumptions between the relationships between the grain prices and other relevant cost factors were made for the purpose of this analysis.

The graph shows that under a grain price range of $40/tonne to $120/tonne the subsidy ranges from approximately 23 cents/litre to 35 cents/litre.

Alberta Grain Commission

Grain Price Scenarios



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VI. SOCIAL/TERTIARY ISSUES

VI. SELECTED SOCIAL AND TERTIARY ISSUES

- DIVERSIFY AGRICULTURAL ECONOMY.
- DEVELOP RENEWABLE SOURCES OF ENERGY THEREBY ALLOWING LIGHT CRUDE COMPONENTS TO BE USED IN OTHER PRODUCTS.
- INSULATE ALBERTA FROM WORLD IMPOSED PROBLEMS IN AGRICULTURE THROUGH THE DEVELOPMENT OF INCREASED DOMESTIC MARKETS FOR GRAIN.
- CREATION OF EMPLOYMENT OPPORTUNITIES IN ECONOMICALLY DEPRESSED RURAL AREAS.
- TRANSFER OF ECONOMIC WEALTH FROM TAXPAYERS TO SPECIFIC GROUPS.

VII. CONCLUSIONS

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These conclusions were formulated in reference to the basic criteria established by the Ethanol Fuels Committee and based on the assumptions that underlie this analysis.

1. *"Must maintain or increase the markets for agricultural products".*

   There will be an increase in the markets for agricultural products, but this increase will be substantially less than the total ethanol industry feedstock requirements.

2. *"Must equal or improve the level of environmental protection".*

   The evidence suggests that both beneficial and detrimental effects may occur. No strong evidence exists to demonstrate that the level of environmental protection would on balance decrease.

3. *"Must retain or improve the safety associated with the handling of fuels".*

   When ethanol fuels are properly blended the safety level associated with fuel handling is maintained.

VII. CONCLUSIONS (Continued)

4. *"Must comply with current government regulations and legislation".*

   The analysis does not assume the by-passing of current regulations and legislation.

5. *"Must achieve a net positive economic benefit for Alberta".*

   According to the analysis which follows, the maximum positive benefit to the province would be $19.6 million. However, this number has been arrived at using multipliers that are not specific to the ethanol industry as such multipliers were unavailable. Accordingly, and within the context of overall cost and benefit flows, approximately $200 million (including spin-off effects), the province cannot be assured of a net positive or negative economic benefit.

6. *"Must not require long-term net public financial support".*

   No evidence exists from this analysis that suggests that public support could be eventually removed and that the industry could be self-sustaining.

VIII. CRITICAL ISSUES FOR FURTHER STUDY

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1. Assess the impact of a national fuel ethanol policy on Alberta, i.e., impact related to displacement of crude.
2. Refine multiplier to reflect the inputs/outputs of the ethanol industry.
3. Assess costs and benefits to the Province of the establishment of an industry for the production of oxygenates (MTBE).
4. Refine analysis of impact of distillers grains on other livestock feeds (e.g., canola meal).
5. Assuming a Provincial stategy of several integrated feedlot ethanol production facilities, undertake a linear program type analysis of feedstock sources and refinery/terminal facilities to optimize plant location with respect to sourcing feedstock and delivery of ethanol to refineries/terminals.
6. Refine analysis of impact of fuel ethanol industry on the Provincial oil industry.
7. Assess economic viability of the ethanol industry servicing specialized sub-markets (e.g., vehicle fleets, bulk fuel markets):
   - implications re distribution infrastructure and associated costs,
   - may enhance refiner acceptance of alcohol fuels, i.e., reduced risk.

OTHER KEY REFERENCES

(Not Otherwise Footnoted)

- Ethanol Plant Costs - Endeco Ltd., Alcohol Week, previous studies.

- Value of ethanol to refiners, marketers - Hycarb Engineering.